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09/862,452	05/23/2001	Tomoo Yamamoto	29273/550	8895

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EXAMINER

UHLIR, NIKOLAS J

ART UNIT

PAPER NUMBER

1773

7

DATE MAILED: 05/12/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/862,452

Applicant(s)

YAMAMOTO ET AL.

Examiner

Nikolas J. Uhlir

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 April 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) 11 is/are withdrawn from consideration.
- 5) ☐ Claim(s) none is/are allowed.
- 6) ☒ Claim(s) 1-10 and 12-15 is/are rejected.
- 7) ☒ Claim(s) 4 and 5 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
- 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
- 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Applicant's election of claims 1-10 and 12-15 in Paper No. 6 is acknowledged.

Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

2. Claims 8-10 are noted to contain nominal apparatus limitations. At this time restriction has not been required between the product claims 1-7 and 12-15 and the apparatus claims 8-10 because the apparatus claims do not recite any significant limitations as to the structure of the magnetic apparatus, and are therefore considered as part of the product claims. If the apparatus claims are amended to contain significant structural limitations (i.e. a specific structure of the magnetic head utilized) they may be subject to restriction based on original presentation.

Claim Objections

3. Claims 4 and 5 are objected to because of the following informalities: The terminology "at least one element selected from" is not proper Markush group terminology. To overcome this objection, the examiner respectfully suggests the applicant utilize the terminology "at least one element selected from the group consisting of." Appropriate correction is required.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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5. Claims 5-6 and 15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In the instant case, claims 5-6 and 15 require a CoCr magnetic layer to be formed on the underlayer. It is unclear whether the CoCr magnetic layer required by claims 5-6 and 15 is intended to be an additional distinct magnetic layer from the magnetic layer required by claim 1, or whether the limitations relating to the magnetic layer in claims 5-6 and 15 are intended to further limit the composition of the magnetic layer recited by claim 1. Clarification is required.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohnami et al. (US6255006) in view of Suenaga et al. (US5131995).

8. The limitations of claim 1 require a magnetic recording medium comprising a non-magnetic substrate, an amorphous or microcrystalline seed layer at least containing Ti and Al formed on the non-magnetic substrate, a magnetic layer containing a Co alloy, and an underlayer formed between the seedlayer and the magnetic layer containing a Co alloy.

9. For the purpose of this examination, the examiner notes that the term "comprising" in the first line of the claim is open language, thus allowing other layers

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aside from those recited to be present. Further, the examiner interprets the phrase, "at least containing Ti and Al" to be open terminology that allows for other elements other than Ti and Al to be contained in the seed layer. Further, the examiner interprets the phrase "formed on" to be open terminology that allows for other layers to be present between the recited layer and the layer upon which it is formed. If the applicant wishes to require layers to be adjacent to one another, the examiner respectfully suggests the applicant utilize more precise terminology, such as "formed directly adjacent to" or "formed directly on the surface of." Last, the examiner interprets the limitation "amorphous or microcrystal seed layer at least containing Ti and Al" to be met by any seedlayer containing Ti and Al, as any deposited solid material will necessarily be amorphous, crystalline, or a mixture of both amorphous and crystalline states.

10. Regarding the limitations of claim 1, Ohnami teaches a magnetic recording medium comprising a NiP plated aluminum substrate (1), a Cr or Cr alloy underlayer (2a), a CrNb underlayer (2b), and a $\text{Co}_{75}\text{Cr}_{16}\text{Pt}_6\text{Ta}_3$ (subscripts are atomic %) magnetic layer, as shown by figure 1 and discussed in example 1 (located a columns 5, line 55-column 6, line 17). It is the examiners position that the substrate, Cr alloy underlayer (2a) and CoCrPtTa magnetic layers of Ohnami are equivalent to applicants claimed substrate, underlayer, and Co containing magnetic layer respectively.

11. It is noted however, that Ohnami does not teach the use of a seedlayer containing at least Ti and Al, as required by the instant claim 1.

12. However, with respect to this deficiency, Suenaga teaches a Titanium substrate for a magnetic recording medium that exhibits improved heat resistance over that of

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conventional NiP plated aluminum substrates (column 1, lines 35-51). This titanium substrate comprises a layer of titanium that has been overcoated with a hardened layer (column 2, lines 45-50). The hardened layer can be formed from a variety of materials, including Ti_3Al (interpreted to comprise 3:1 Ti:Al, i.e 75 at% Ti, 25 at. % Al), Al_3Ti (3:1 Al:Ti, i.e 75 at% Al, 25 At% Ti) TiN, TiC, ZrC, and WC (column 4, lines 15-25).

13. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the Ti_3Al or Al_3Ti coated Ti substrate taught by Suenaga for the NiP plated Al substrate taught by Ohnami.

14. One would have been motivated to make this substitution due to the expected increase in heat resistance of the substrate that one would expect to gain as a result, in light of the teaching in Suenaga that hardcoat coated Ti substrates exhibit higher heat resistance than conventional NiP coated Al substrates. Regarding the specific selection of Ti_3Al or Al_3Ti , one would have been motivated to select these compounds as the hardcoat layer due to the fact that Suenaga teaches the equivalence of these materials to the other materials cited as suitable for use as a hardcoat over a Ti substrate.

15. The limitations of claim 2 are met as set forth above for claim 1.

16. The limitations of claim 3 require the layer containing at least Ti and Al to specifically contain at least 35-65 at% Ti and at least 35-65 at% Al. The examiner notes that neither Ohnami nor Suenaga specifically teach the required composition. However, Suenaga teaches that in order for the Hardcoat coated titanium substrate to be viable as a substrate for magnetic recording medium, the hardcoat must have a hardness of at least 250Hv (column 5, lines 42-53). The examiner notes that Suenaga teaches that

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TiAl has an Hv of 200, Ti_3Al has a hardness of 250Hv, and Al_3Ti has a hardness value of 260Hv. It is clear from these examples that the composition of the titanium aluminum alloy has an impact on the hardness of the alloy, with hardness increasing as the concentration of aluminum or titanium in the alloy increases.

17. Therefore the examiner takes the position that the composition of the titanium aluminum alloy utilized as the hardcoat layer is a results effective variable. It would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the concentration of Ti and Al in the alloy within the range of 3:1 Ti:Al to 1:3 Ti:Al in order to obtain a TiAl alloy having a desired level of hardness.

18. The limitations of claim 4 require the underlayer to comprise a multi-layered structure having at least two layers, the first underlayer containing Cr or CrTi and the second underlayer containing at least one element selected from Cr, Nb, Mo, Ta, W, and Ti. These limitations are met as set forth above for claim 1.

19. Claim 5 requires the use of a CoCr alloy magnetic layer containing 0.5-8.0 at% of at least one element selected from C, B, Si, and Ta to be formed on the underlayer. The examiner interprets the limitations of claim 5 to require that the magnetic layer of claim 1 comprise a CoCr alloy containing 0.5-8.0 at. % of at least one of the elements cited. Thus, in light of the fact that the magnetic layer utilized by Ohnami is a $CoCr_{16}Pt_6Ta_3$ alloy, the limitations of claim 5 are met.

20. Claims 6-9, and 12-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohnami as modified by Suenaga as applied to claim 1 above, and further in view of Bertero et al. (US6150015).

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21. Ohnami as modified by Suenaga does not teach the use of an intermediate layer containing CoCr between an underlayer and magnetic layer, as required by claim 6.

22. It should be noted that the examiner interprets the limitations of claim 6 regarding the composition of the magnetic layer in the same manner as stated above for claim 5.

23. With respect to the deficiencies of Ohnami as modified by Suenaga, Bertero teaches that the lattice matching between a Cr or Cr alloy underlayer and a HCP Co based magnetic layer can be improved by inserting a CoCr based nucleation layer between the underlayer and the magnetic layer, thereby improving the lattice matching between the underlayer and the magnetic layer (column 12, lines 36-65). Bertero teaches that for a CoCrPtTa alloy magnetic layer, the nucleation layer can be made without the Pt to conserve cost. For example, for a $\text{CoCr}_{15}\text{Ta}_4\text{Pt}_3$ magnetic layer, a $\text{CoCr}_{15}\text{Ta}_4$ layer is suitably used as the nucleation layer (column 13, lines 30-45).

24. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to insert a nucleation layer as taught by Bertero et al. comprising $\text{CoCr}_{16}\text{Ta}_3$ between the $\text{CoCr}_{16}\text{Pt}_6\text{Ta}_3$ alloy magnetic layer and the CrNb underlayer taught by Ohnami as modified by Suenaga.

25. One would have been motivated to make such a modification due to the teaching in Bertero that the lattice matching between a Cr or Cr alloy underlayer and a Co based magnetic layer can be improved by inserting a nucleation layer between the underlayer and the magnetic layer. One would have specifically utilized $\text{CoCr}_{16}\text{Ta}_3$ for this purpose due to the teaching in Bertero that for a CoCrPtTa alloy magnetic layer, the nucleation layer can be made without the Pt to conserve cost. Thus, in light this teaching and the

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fact that the magnetic layer specifically utilized by Ohnami as modified by Suenaga is a $\text{CoCr}_{16}\text{Pt}_6\text{Ta}_3$ alloy, one would have been motivated to utilize a $\text{CoCr}_{16}\text{Ta}_3$ alloy containing no Pt as a nucleation layer with a reasonable expectation of success.

26. The limitations of claim 7 require the magnetic layer of claim 1 to have an hcp crystal structure and to be oriented in the 110 direction relative to the plane parallel with the substrate.

27. The examiner interprets "hcp" in claim 7 to mean "hexagonal close packed" as "hcp" is the industry accepted acronym for this crystal structure.

28. Regarding these limitations, it is noted that neither Ohnami nor Suenaga teach the crystal structure and orientation of the CoCrPtTa magnetic layer utilized.

29. However, the examiner feels that these limitations are met by the combination of Ohnami as modified by Suenaga with Bertero, as stated above for claim 6. Bertero teaches that CoCrPtTa alloys grown over a nucleation layer such as CoCrTa have a hexagonal close packed structure (column 12, lines 40-45) and are oriented with the C-axis in plane with the substrate (column 18, lines 24-44). The combination of Ohnami as Modified by Suenaga with Bertero results in a medium that is grown on the same type of substrate (nonmagnetic), the same type of seedlayer (TiAl), the same types of underlayers (multiple Cr based) with the same type of alloy (CoCrPtTa) as that disclosed by the applicant in the specification and required by claims 1-6. Further, the layers are grown via the same method (epitaxial deposition via sputtering) as that disclosed by the applicant in the instant specification. Thus, in light of these similarities, the examiner takes the position that the limitations of claim 7 are met.

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30. The limitations of claim 8 require a generic apparatus for use with a recording medium having a TiAl seedlayer. It is noted that Bertero teaches a magnetic recording/reproducing apparatus that incorporates a magnetoresistive head that is suitable for recording and reproducing information from a medium utilizing a CoCrPtTa magnetic layer, as shown at column 21, lines 44-54. This apparatus meets the apparatus limitations of claim 8.

31. The limitations of claims 12-15 are met as set forth above for claim 7 above.

32. Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ohnami as modified by Suenaga and Bertero as applied to claim 6 above, and further in view of Rubin et al. (US6421195).

33. Ohnami as modified by Suenaga and Bertero do not teach a magnetic recording apparatus utilizing a spin valve or tunnel effect type head, as required by claims 9-10.

34. However, Rubin teaches that suitable heads for longitudinal magnetic recording include spin valves, magnetoresistive heads, tunnel junctions (equivalent to applicants claimed tunnel effect type head), or inductive read heads.

35. Therefore it would have been obvious to one of ordinary skill in the art to utilize a spin valve or tunnel effect type sensor as taught by Rubin as the magnetic head utilized in Ohnami as modified by Suenaga and Bertero, as these head structures are recognized as equivalent for use in recording and reproducing on longitudinal magnetic recording media.

36. The applicant is respectfully reminded that substitution of equivalents requires no express motivation as long as the prior art recognizes the equivalency. *In Re Fount* 213

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USPQ 532 (CCPA 1982); *In Re Siebentritt* 152 USPQ 618 (CCPA 1967); *Grover Tank & Mfg. Co. Inc V. Linde Air Products Co.* 85 USPQ 328 (USSC 1950).

Examiners Note

37. Regarding the rejection of claims 3 and 13 over Ohnami as modified by Suenaga. The examiner respectfully invites the applicant to provide a clear showing that a TiAl alloy having concentrations of Ti and Al between 35-65 at% respectively do not possess the minimum required hardness (250Hv) that Suenaga states is necessary to enable a hardcoat coated Ti substrate to be useful as a magnetic media substrate. Although Suenaga teaches that a 1:1 Ti:AL (50 at%:50at%) ratio does not possess the required hardness, it has not yet been established that the hardness required by Suenaga is not met within the applicants entire claimed range.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nikolas J. Uhler whose telephone number is 703-305-0179. The examiner can normally be reached on Mon-Fri 7:30 am - 5 pm.

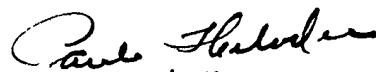
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Thibodeau can be reached on 703-308-2367. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-0389.



nju
May 8, 2003



Paul Thibodeau
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Technology Center 1700